RESEARCH ARTICLE

An Overview of Diabetes Management in China: The Application of Innovative Care for Chronic Conditions Framework
中国糖尿病管理概述：慢性病创新照护模式的应用

By Chien-Ching Li, PhD*

ABSTRACT
China has the largest number of people with diabetes in the world. In the past, no overall assessment of diabetes management efforts has been done in China. Today diabetes has become a significant public health problem in China. It is imperative to gain a comprehensive view of diabetes management efforts within China's specific socio-political infrastructure. In this study, the Innovative Care for Chronic Conditions framework (ICCC) comprised of Macro (policy environment), Meso (health care organization and community), and Micro (patient interaction) levels developed by World Health Organization was used as an analytic framework to demonstrate status and gaps in existing diabetes management in China. An integrative multi-level literature review was conducted using the ICCC framework. Multiple resources, including English and Chinese-language references databases and information from China governmental health websites, were used. Today, responsibilities for diabetes management in China are mainly delegated to health care providers. This effort could be enhanced and complemented by increased support from the government, more resources for diabetes management in the community; structures from health organizations, and stronger partnerships between health care organizations and the community. The roles of patients and their families in diabetes management should also be elevated. Researchers, health practitioners, policy makers and other stakeholders are able to use the findings to delineate optimal strategies for diabetes prevention and management. In the future, the ICCC framework can serve as the conceptual basis for chronic conditions situation analysis and health care system design in China.

BACKGROUND
China has the largest number of people with diabetes in the world. The diabetes population is estimated to grow to 129.7 million in 2030 from 90 million in 2011 (Whiting, Guariguata, Weil, & Shaw, 2011), which will have a dramatic impact on the health of people and on healthcare costs in China. To respond to the current situation, efforts toward diabetes management should be made across different levels of the health care system. Prior studies had been done in identifying the prevalence, mortality, risk factors, and the complications of diabetes in China (Chan & Cockram, 1997). However, there has been no overall assessment of diabetes management efforts in China. Since diabetes has become a significant public health problem in China, it is imperative to gain a comprehensive view of diabetes management efforts within China's specific socio-political infrastructure.

In 2002, the World of Health Organization (WHO) proposed the "Innovative Care for Chronic Conditions framework (ICCC)" comprised of macro (policy environment), meso (health care organization and community), and micro (patient interaction) levels (Figure 1) to improve care for chronic conditions in middle or low income countries (WHO, 2002). Within the macro-level, policy activities including legislation, leadership, policy integration, partnerships, financing, and allocation of human resources, on diabetes prevention and control will be identified. A positive policy environment will optimize health care for diabetes and reduce the burden of diabetes. In addition, various activities for diabetes prevention and control that occur in health care organizations and communities are within the meso-level. Appropriate, sufficient, and timely care and services provided by health care organizations will improve the health condition of people with diabetes. Additionally, most diabetic patients spend majority of their time living in the community. Comprehensive community resources are vital to the management of diabetes. Regarding the

* Dr. Chien-Ching Li is an Assistant Professor at the Department of Health Systems Management, College of Health Sciences, Rush University Medical Center. Address: 1700 W. Van Buren Street, Triangle Office Building, Suite 126B, Chicago, IL 60612, USA, Email: Chien-Ching_Li@rush.edu, Tel: 312-942-7465.

micro-level, patient interventions include the activities between patients and families, healthcare teams, and community partners. Better outcome for diabetes will be obtained from good interaction with patients. Finally, better outcome for chronic conditions can be achieved when each level works effectively and interacts well with other levels. ICCC is now being used as a conceptual framework for health care system design and health care situation analysis around the world (Epping-Jordan, Pruitt, Bengoa, & Wagner, 2004). The International Diabetes Federation (IDF) indicates that ICCC can be used to improve health services for people with diabetes and to provide population-based interventions for the prevention of diabetes (IDF, 2009).

The purpose of this paper is to demonstrate the status and gaps in existing diabetes management in China by conducting a situation analysis using ICCC as an analytical framework. Researchers, health practitioners, policy makers and other stakeholders are able to use the findings to delineate optimal strategies for diabetes prevention and management.

METHODS

Data sources

Two reference databases, PubMed (http://www.ncbi.nlm.nih.gov/pubmed) and ProQuest Health Management (http://www.proquest.com), were used to search English-language literature. Chinese-language literature from VIP Information (http://www.cqvip.com), one of the largest online databases in China, was identified as significant complementary resources to obtain a depth and breadth of vision. In addition, diabetes-related information on governmental health websites was searched through the Google search engine to explore the content of diabetes-related programs and activities found on web sites. Articles and web pages that relate to diabetes management in China and discussed at least one of the specific levels of the diabetes management in macro-level, meso-level, and/or micro-level were selected. In total, 85 references, including 66 journal articles and 19 web pages, were determined to be the most relevant (Figure 2).

Analytical framework

Based on the collected information, any effort made within the macro, meso, and micro levels were identified according to the level of institutions that govern and develop programs and activities for diabetes management in China. Within the macro-level, diabetes efforts made by governmental health-sectors and governmental non-health sectors were identified. In terms of meso-level, efforts made by formal health care organizations, community organizations, health vendors, nonprofit organizations, and education institutions were included. Regarding the micro-level, grassroots efforts presented by patients and families and collective efforts between patient and family, community partners, and health care teams were identified. Finally, various sources of information were further classified into specific principles under each level of macro, meso, and micro of ICCC. Existing programs and activities of diabetes management are summarized according to ICCC principles within macro, meso, and micro level.

RESULTS

In the following, we described diabetes prevention and management efforts in China that are consistent with the specific ICCC principles under Macro (policy environment), Meso (health care organization and community), and Micro-level (patient and family).

Macro Level: Policy Environment

Supporting Legislative Framework

- Bans on Tobacco Uses
- Promotion of Physical Activities

Legislation and regulation can reduce the burden of chronic conditions and can protect the rights of people with chronic conditions (WHO, 2002). The lack of physical activities, smoking, and obesity has been identified as the primary risk factors of developing diabetes (Epping-Jordan et al., 2004).

China government issues bans on smoking in schools and public places and cigarettes selling to adolescent, and promotes physical activity among people. All the efforts are helpful to reduce people's risk of developing diabetes (Zhai et al., 2002).

Developing and Allocating Human Resources

- National Personnel Training of Integrative Diabetes Prevention and Control
- Workshop of Diabetes Prevention for Healthcare Professionals
- Integration of Community and Hospital Health Education

The care of chronic conditions can be enhanced by training health care professionals or workers through means such as upgrading medical or nursing school curricula and mandating continuing education for other healthcare professionals in the specific area of chronic conditions (WHO, 2002). In China, several types of training for healthcare professionals are provided by government sectors such as the Ministry of Health (MOH), the Chinese Center for Disease Control and Prevention (CDC), and the National Center for Chronic and Non-communicable Disease Control and Prevention (NCNCD). The training mainly focused on the enhancement of knowledge and skills of diabetes management (Chinese CDC, 2006; MOH, 2009) and the collaboration between multidisciplinary healthcare professionals in diabetes care (Chinese CDC, 2007).

Strengthening Partnerships

- Dietary Guidelines for Chinese Residents (the Chinese Food Pagoda)
- National Plan of Action for Nutrition
- International Meeting on Nutrition and Agriculture
- Self-Management Program in Chronic Disease in Beijing
- Incentive Project of Dissemination of Diabetes Knowledge
- Integration of Community and Hospital Health Education
- Health Education Intervention on Patients with Diabetes

Within the policy environment, strong partnerships among government sectors (e.g., education, agriculture, etc.) have the potential to influence health and chronic conditions. It is also imperative to work with non-government health sectors (e.g., health care providers, non-profit organizations etc.) and community entities, including residential committee, schools, etc (WHO, 2002). In preventing diabetes, nutrition management plays an important role. Three notable actions of nutrition management have been taken in China. First of all, the Institute of Nutrition and Food Hygiene at the Chinese Academy of Preventive Medicine (INFH-CAPM) developed the "Dietary Guidelines for Chinese Residents and Chinese Pagoda" with the Chinese Nutrition Society to delineate a good diet (Chinese Nutrition Society, 1999; Zhai et al., 2002). The second was the "National Plan of Action for Nutrition" implemented by the collective efforts of governmental sectors, including the INFH-CAPM, the MOH, the Ministry of Agriculture (MOA), and the State Council (Ge & McNutt, 2000; Zhai et al., 2002). The major goal of the plan is to improve the nutritional status of people and to prevent diet-related non-communicable diseases (DR-NCDs). Third, the international meeting on nutrition and agriculture was launched by INFH-CAPM, the MOH and the MOA to identify new nutrition related issues and to prevent and control DR-NCDs (Zhai et al., 2002). Additionally, some programs and activities on diabetes management were carried out. For example, a series of self-management programs was initiated under the collaboration between the CDC and the Community Health Services Center (CHSC) in Beijing to provide patients a strategy of chronic disease prevention and control (NCNCD, 2007b). Information on diabetes prevention and control was disseminated to patients and the general public through the partnerships among government sectors and pharmaceutical companies (J. Huang, 2008; L. Zhu et al., 2004). The MOH also collaborated with the World Diabetes Foundation (WDF) to train physicians and nurses in community hospitals in order to let low-income diabetic patients get economic and efficient treatments (MOH, 2009).

Providing Leadership and Advocacy

- National Plan of Prevention and Control of Diet-Related Non-Communicable Diseases
- National Project for Diabetes Management
- United Nations World Diabetes Day-China Action in Beijing
- Country-Wide Diabetes Media Intervention
- Dissemination of Diabetes Prevention and Control Knowledge
- Shanghai Resident Medical and Health File System
- Health Education Intervention on Diabetes
- National Plan of Action for Nutrition
- International Meeting on Nutrition and Agriculture

Decision-makers not only can influence senior political leaders to advance care for chronic conditions, but also can increase awareness among policy-makers, health care leaders, health care workers, community, patients, and families (WHO, 2002). In the past 10 years, DR-NCDs, including diabetes, have increased rapidly in China. Several national programs and activities have been implemented to advocate the prevention and control of DR-NCDs. In 1996, the "National Plan of Prevention and Control of DR-NCDs" as a large scale of national program was issued by the MOH. Activities including policy reform, environment development, disease surveillance, and integrated intervention, were carried out across 17 provinces in China (Zhai et al., 2002). Moreover, some diabetes-specific interventions and programs have been conducted. In 2003, a 5-year "National Project for Diabetes Management" was initiated by NCNCD to explore and build the diabetes management model by integrating community and hospital (NCNCD, 2003a, 2003b). Starting in 2007, the MOH has undertaken the promotion of "United Nations World Diabetes Day" to enhance the public awareness of diabetes and to promote people's health behaviors (NCNCD, 2007a, 2008). The MOH is also in charge of the work of diabetes knowledge and information dissemination to the public via mass media in China (J. Huang, 2008; MOH, 2008; Pan, 2005). To educate diabetic patients, a large diabetes health education plan carried out by the Chinese CDC and was delivered to patients via hospitals from 20 cities (L. Zhu et al., 2004). In order to identify people at high risk for diabetes and to facilitate the follow-up services for existing diabetic patients, Shanghai CDC developed the "Resident Medical and Health File System" to collect people's health information, family history, and health related risk factors (R. Li, Li, & Wang, 2002).

Integrating Policies

- Diagnosis and Treatment Guideline for Non-Communicable Disease
- Chinese Diabetes Prevention and Control Guideline
- National Plan of Prevention and Control of Diet-Related Non-Communicable Diseases
- National Project for Diabetes Management

Policies are most effective when they emphasize population-based management and encompass prevention, promotion, and control strategies (WHO, 2002). The Chinese CDC introduced the "Guideline for Diagnosis and Treatment of Non-Communicable Disease" to healthcare professionals working in different institutions concerned with disease control and prevention. This guideline clearly delineates the steps and strategies for prevention and treatment of diabetes, including health education, dietary and progress monitoring, mental consultation, etc (NCNCD, 2002). In addition, the Chinese CDC also compiled the "Guideline for Chinese Diabetes Prevention" based on medical evidence to provide the strategies of primary, secondary and tertiary prevention of diabetes to healthcare professionals (Chinese CDC, 2003).

Promoting Consistent Financing

- Increasing Health Insurance Coverage in Urban and Rural Areas
- Governmental Grant for Diabetes Research

Financing decisions based on principles of equity and effectiveness can ensure adequate access to health care and coverage for all segments of the population (WHO, 2002). China's government

implemented a series of health insurance initiatives such as "Basic Medical Insurance" and "New Cooperative Medical Scheme" to facilitate affordable health care services in urban and rural areas (Eggleston, Ling, Qingyue, Lindelow, & Wagstaff, 2008; Fan, 2007). In order to support and encourage healthcare professionals and researchers devoting themselves to diabetes-related research, many national grant opportunities for diabetes-related research are offered by the National Natural Science Foundation of China (China NSF, 2008).

Meso Level: Health care Organization

Promoting Continuity and Coordination

- Integration of Community and Hospital Diabetes Management
- Network of Chronic Conditions Control Focusing on Diabetes and Hypertension
- Comprehensive Community Management of Diabetes
- Diabetes Group Management

Patients with chronic conditions need coordinated services across primary, secondary, and tertiary care. Continuity of care is also important for patients with chronic illnesses (WHO, 2002). In China, hospitals and CHSC have made efforts to coordinate health care services. Integrated diabetes interventions, including health education, diet and exercise treatment, medication consultation, and blood glucose monitoring were implemented in hospitals and CHSC and demonstrated positive effects in diabetes management (Cui, 2007; J. He, Zhu, & Pu, 2005; G. Li et al., 2008; B. Lin, Bin, & Tao, 2006; Zhang, Du, Qiang, Wu, & Ding, 2005; X. Zhao, Wu, Wu, Li, & Zhang, 2007; L. Zhou, 2007). The "Network of Chronic Conditions Control" was collaboratively established by 222 CHSC in Guangxi to provide health care services for patients with diabetes and hypertension ("Health Message," 2006). Additionally, the integration of community-based and hospital-based diabetes management can facilitate the coordination of health care services. In Guangdong, hospitals and CHSC worked together on the establishment of the diabetes information system and referral system, the training of healthcare professionals, the standardization of outpatient and inpatient services, etc. Patients' control of blood glucose and the ability of self-management were improved (Z. Chen, Zhao, Yin, & Lin, 2007; M. Li, Xu, & Sun, 2009). Regarding the continuity of health care, diabetes group management is emerging. A health care team consisting of various healthcare professionals such as physicians, nurses, and dieticians provides comprehensive diabetes management for patients with diabetes (Fang & Fang, 2006; J. Huang, Sunyan, Liu, Zhao, & Fu, 2007; Yu et al., 2009). Numerous studies have showed that diabetes group management was beneficial for improving patients' diabetes knowledge (J. Huang et al., 2007; J. Zhou, Gao, Fong, Song, & Chen, 2004), weight (Ai & Yang, 2008; Tang & Qiu, 2004), self-management ability (C. Huang et al., 2005; Yu et al., 2009), and for controlling of blood glucose (Ai & Yang, 2008; Fang & Fang, 2006; J. Gu, 2001; C. Huang et al., 2005; Tang & Qiu, 2004; C. Yang, 2008; Yu et al., 2009; C. Zhao, 2009; H. Zhou et al., 2004).

Using Information System

- Health File System
- Diabetes and Complication Management System
- Outpatient Hotline for Appointment
- Electronic Database for the Diabetes Clinic

Timely information about patients with chronic conditions is a critical component of effective care. Information systems that gather and organize data about epidemiology, treatment, and health outcomes and the system that lists patients with chronic conditions (e.g., patient registry) can serve a reminder function for prevention and follow-up services (WHO, 2002). In China, the adoption of hospital information systems is still in the early stage. Some local hospitals developed the "Health File System," which records diabetic patients' health information, to facilitate the clinical diagnosis and follow-up services (Hong, Zhong, & Wang, 2004; Miu, Zheng, & Tao, 2008; Y. Wang, 2008). Using the system, physicians are able to monitor patients' health condition and treatment progress, and to delay and reduce the risk of developing complications. Patients' blood glucose and diabetes

knowledge were improved after adopting a health file system (Miu et al., 2008; Y. Wang, 2008). In 2005, the "Diabetes and Complication Management System" was collaboratively developed by 60 hospitals from 28 cities to build a database linking medical and health files to monitor patients' blood glucose, blood pressure, weight, medication, diet, etc (Chinese CDC, 2005).

Supporting Diabetes Self-Management and Prevention

- Integrated Diabetes Education by Hospitals and Community Health Services Centers
- Diabetes Clubs by Hospitals and Community Health Services Centers
- Diabetes Self-Management Programs
- Center for Diabetes Prevention in Hospitals

Effective self-management can minimize the complications, symptoms, and disability associated with chronic conditions. Therefore, patients and their caregivers need to be informed about the strategies of self-management and need to be motivated to implement self-management on a daily basis (WHO, 2002). Education is an important part of self management. In China, diabetes education is primarily implemented by hospitals and CHSC. The content covers self-management education, the knowledge of diabetes prevention and control, the development of a healthy lifestyle, the use of medication, regular monitoring of blood glucose, etc. The effectiveness of diabetes education has been recognized in improving blood glucose control (An & Deng, 2008; Y. Chen, 2007; Chu, 2004; Deng, 2008; S. He, 2004; A. Wang et al., 2005; Y. Wang & Zhang, 2006; Wei et al., 2008; Wu et al., 2006; L. Zhu et al., 2005), health behaviors (A. Wang et al., 2005; Y. Wang & Zhang, 2006; Wu et al., 2006), diabetes knowledge (An & Deng, 2008; Dong, Sun, Ying, & Lou, 2008; S. He, 2004; A. Wang et al., 2005; Y. Wang & Zhang, 2006; Wu et al., 2006), and adherence to physician's advice (Y. Chen, 2007; Dong et al., 2008; S. He, Huang, Li, & Li, 2009; A. Wang et al., 2005; Wu et al., 2006; Yuan, Shen, & Meng, 2004). In addition, there is some initial recognition of the value of diabetes support groups such as diabetic patient clubs formed by hospitals and CHSC. In diabetes clubs, patients and their families are provided with services such as diabetes education, self-management training, dietary treatment, exercise treatment, and medication treatment from the multidisciplinary health care team. Recent studies have shown performance of diabetes clubs in glucose control (Gao, Yang, Hu, & Gao, 2005; S. He et al., 2009; J. Lin, Li, Wang, Zhu, & Lin, 2008; Luo & Yu, 2006; Yan, Li, & Wang, 2008; Y. Zhao, Li, Yan, & Wang, 2008), diabetes knowledge (J. Lin et al., 2008; L. Yang, He, & Lin, 2009), dietary control and exercise enhancement (Yan et al., 2008; Y. Zhao et al., 2008), and other health indicators (S. He et al., 2009; L. Yang et al., 2009).

Organizing and Equipping Health Care Teams

- Evaluation Diabetes Knowledge of Healthcare Professionals
- Examining the Role of Local Hospitals in Diabetes Prevention and Control

Health care teams need necessary supplies, medical equipment, laboratory access, and essential medications to manage chronic conditions (WHO, 2002). They also need guidelines for care and diagnostic and treatment algorithms to make optimal decisions. Regarding the diabetes knowledge of healthcare professionals, one recent study indicated that more than half of the nurses in China did not have adequate diabetes knowledge and skills before they received training provided by physicians (Xi & Hu, 2005). This is alarming, since there is evidence to suggest that the physicians' level of diabetes prevention and treatment knowledge in community hospitals is also low (X. Chen, Su, Liu, Guo, & Tao, 2006; Y. Gu, Zhao, Wang, Wang, & Cheng, 2008). Regarding the existing equipment in hospitals, challenges exist. Some local hospitals lack diabetes medical equipment (e.g., poor testing equipment in laboratory). As a result, patients cannot obtain required examinations, which affect the development of patients' diabetes care in China (T. Wang, 2005).

Meso Level: Community

Raising Awareness, Reducing Stigma, and Encouraging Better Outcomes through Leadership and Support

- Diabetes Prevention and Control Efforts in Boulevard Block Office

- Diabetes Clubs
- Shanghai Chronic Disease Self-Management Program

Communities play a crucial role in improving the quality of life of patients with chronic diseases. The leaders of community organizations (e.g., international organizations, community development groups) can raise awareness about chronic conditions, reduce stigma associated with chronic conditions, and advocate better health care for chronic problems (WHO, 2002). In China, Boulevard Block Office (BBO) is the formal organization and area community unit. One of its responsibilities is to develop, organize, and coordinate health related tasks in the community. In the community, some education activities such as seminars and lectures of diabetes prevention and control were provided by BBO (Dongliu BBO, 2006; Shiyuan BBO, 2008; Xiluoyuan BBO, 2007). In addition, some higher education institutions have also made some efforts. The College of Nursing at Hangzhou Normal University organized a diabetes club to provide knowledge and information of diabetes care to patients and their families, and patients' medication compliance and health behaviors were enhanced after receiving health education from the diabetes club (B. Zhu, 2006). Additionally, the School of Public Health at Fudan University introduced the "Chronic Disease Self-Management Program (CDSMP)." Patients with diabetes were also involved. CDSMP provided patients courses regarding the concepts and tools of self-management. The program has shown evidence in promoting patients' disease knowledge, self-management skills, positive health behavior, self-confidence, health status, and quality of life (Dongbo, Ding, McGowan, & Fu, 2006; Fu et al., 2003).

Providing Complementary Services
- China Diabetes Education Program
- Beijing Diabetes Care and Education to Community Program
- Improving Diabetes Education and Care in China Program
- Bayer Diabetes Houses

Local and international non-government organizations can provide complementary services to reduce the redundancies in services between health care organizations and community organizations (WHO, 2002). Regarding personnel training for diabetes management in China, some great efforts are made by Project HOPE, an international non-profit organization dedicated to achieving sustainable advances in health care around the world. Project HOPE partnered with the MOH to establish the Beijing HOPE Project office and initiated several multi-collaborative diabetes related programs, including "China Diabetes Education Program," "Beijing Diabetes Care and Education to Community Program," and "Improving Diabetes Education and Care in China Program", to train diabetes educators and community physicians to be skillful in diabetes prevention and control, and to improve the overall quality of diabetes care (Hope Project, 1997, 2007, 2008). Furthermore, health care vendors have intervened in terms of both providing advanced training for diabetes and providing equipment. Bayer HealthCare launched the diabetes prevention plan called "Bayer Diabetes Houses" in Beijing, Shanghai and Guangzhou. They partnered with local community hospitals to provide patients with comprehensive diabetes care and disease management information as well as glucose monitoring equipment. Additionally, diabetes related training was also provided to community physicians (Shui, 2006).

Micro Level: Patient and Family

Interaction between Patient, Health Care Organization, and Community
- Diabetes Friends and Chinese Diabetes Club
- Hospital-Community-Family based Behavioral Intervention

Better outcomes for chronic conditions are achieved only when patients and their families, community supporters, and health care teams are informed, motivated, prepared, and are working together (WHO, 2002). To achieve better chronic outcome, the role of patient and family

should be elevated. Today some grass roots efforts are presenting by patients and their families. With the rapid development and widespread use of the internet in China, some self-help groups such as "Diabetes Friends" and "Chinese Diabetes Club" that have been formed by patients and their families use online blogs and discussion boards to communicate with each other and with physicians (Association of Diabetic Patients, 2008; Diabetes Friends, 2008). This would enable patients and their family members to share experience with others who have diabetes and receive timely professional answers to their questions.

As for the triad at the center of the ICCC framework, it is important to facilitate collaboration among the patient and family, community partners, and health care team. In order to enhance the interaction between patients and health care team, physicians cooperated with diabetic patients to identify appropriate lifestyle, develop the ability of self-management, and to provide correct diabetes knowledge in Jiaozuo People's Hospital of Henan. After the implementation of collaborative diabetes management, over half of patients knew how to apply diabetes knowledge and self-management skills to maintain their health after discharge from the hospital (P. Zhao, Wang, Wang, & Cuei, 2006). In Hubei, Wuchang Hospital implemented the hospital-community-family-based diabetes intervention to improve patients' quality of life. In the intervention, nurses provided patients with health education and the monitoring of physical indicators. The family intervention group consisted of community nurses and one of the family members was established to enhance the family support system, facilitate self-management, and to improve health lifestyles. After the intervention, patients' lifestyle and physical indicators such as blood glucose, blood pressure, and HbA1c were significantly improved (You, Zhu, Zeng, & Pan, 2009).

DISCUSSION

Based on the situation analysis of diabetes management in China, it is evident that some efforts have been made to manage diabetes. However, several challenges or problems are illustrated through the lens of the ICCC framework.

At the macro level, several policy elements within China's current infrastructure of diabetes care are weak and need to be enhanced. First, national and integrated diabetes programs are limited. Most diabetes prevention and management activities were sponsored by commercial pharmaceutical companies. Collaborative efforts between governmental sectors, health care providers, and community organizations on diabetes prevention and control are limited. To optimize care for diabetes, the government should provide leadership in establishing a system of integrated diabetes management through the alignment of governmental organizations, health care organizations, and community organizations (Song, Jin, Wang, Wang, & Wang, 2005; X. Wang, Song, & Jin, 2005). Second, diabetes is a complicated chronic disease and health providers need to provide continuous and coordinated care services for patients to maintain or improve their health. Although the urban and rural health insurance has been implemented in China, the integrated financing structure for diabetes care has not been established in the health delivery system. Pay-for-performance (P4P), which aligns providers' incentives with quality improvement agenda, is a good option to be implemented within current health insurance programs in China (Rosenthal, Fernandopulle, Song, & Landon, 2004) and P4P has shown improvements in HbA1c vales among diabetic patients (Coleman, Reiter, & Fulwiler, 2007). Third, the fundamental element of diabetes prevention and management is the training of healthcare professionals. In China, the lack of diabetes continuous education for healthcare professionals is an important issue. It is imperative for Education authorities to upgrade the model curricula and adopt active teaching techniques in medical and nursing schools. For example, the adoption of the case study method for nursing students may better enable students to understand the difficulty in taking care of clients with chronic illnesses (Sandstrom, 2006). Additionally, the development of additional continuing education programs for healthcare professionals in health care organizations is another important task that needs to be initiated. The diabetes education programs and workshops can be established inside or outside the organization to provide current diabetes management skills to healthcare professionals (Valdez et al., 2007).

Within the meso-level of healthcare, the most common problem is the failure to organize care for chronic conditions. First, the lack of incentives, organizational goals, and improvement strategies for diabetes care in health care organizations is a significant problem in China. This will impede the provision of organized and coordinated diabetes care services. Also, physicians and other healthcare professionals should play the role of leaders in improving the care of chronic conditions by establishing and adopting evidence-based guideline. In China, physicians provide diabetes care by using general guidelines rather than evidence-based guidelines. Without available evidence-based guideline, it will be difficult for healthcare professionals to make effective treatments and interventions in diabetes care. The American Diabetes Association and the American Association of Clinical Endocrinologists has outlined an evidence-based guide for managing patients with diabetes while maintaining the clinical practice guidelines (Fisher & Kapustin, 2007). This could serve as a good foundational reference for healthcare professionals to adopt and develop appropriate diabetes guidelines according to China's health care context. Regarding improvement strategies, continuous quality monitoring and quality improvement projects via rewards (i.e., P4P) should be implemented to improve the quality of diabetes care. Second, health care teams are not well organized and equipped in China. Most education training programs for healthcare professionals are led by governmental sectors. Only a few education efforts have been implemented or led by health care organizations. The Ministry of Education and health care organizations should work together to design effective training curriculum and to develop continuing education programs for healthcare professionals in order to increase the capability of healthcare professionals to provide better diabetes care. Third, health care organizations need to enhance the continuity and coordination of health services and the use of information systems. In China, follow-up work as part of continuity of care does not seem to be a focal issue in health care organizations. This can be facilitated and enhanced by incorporating the role of care coordinator in the health care system. Besides, one of the stated reasons for the lack of continuity is not having a structured management of records to be used in follow-up (H. Li, Yang, & Shen, 2006; J. Lin, 2007). In China, hospital information systems are just starting to take hold. In April 2009, the Chinese government approved a new health care plan. The plan encourages the use of modern information technology to enhance the development of a medical record-keeping system ("Healthy Outlook," 2009). The design of appointment and reminder systems can also be used to provide a structure supporting follow-up for patients with chronic conditions.

Within the meso level of community block, community resources can fill the gap of services or resources not provided by healthcare organizations. However, less diabetes management efforts (i.e. mobilization and coordination of resources in diabetes management) were made by community organizations and groups. Profit organizations (e.g. Bayer HealthCare) and non-profit organizations (e.g. Project HOPE) can be the invaluable resources used to fill the gap. Community units (e.g. BBO) can collaboratively work with Bayer HealthCare to raise funds for diabetes prevention to provide the newest medicine and treatment to support better diabetes care in the community. In addition, there is no formal linkage between health care organizations and community health services centers. To be more effective in promoting diabetes management, a solid and strong connection should be established with health care organizations in the future.

At the micro level, patients and families have strong impacts on health outcomes. In China, internet-based self-help groups organized by patients and their families are now becoming a trend. This would enable diabetics and their family members to exchange diabetes management information with healthcare professionals and others. It is possible to expand the social networking of diabetes care broadly and quickly. Additionally, in order to have successful outcomes for patients, the partnership between patients and families, community partners, and health care teams needs to be enhanced. In China, this partnership is not well established because no formal link exists between communities and health care organizations. In order to make the partnership work optimally, it is imperative to establish an integrated system between health care organizations

and community organizations and to have prepared, informed, and motivated patients and families, community partners, and health care teams.

This paper used the ICCC framework to help us better understand the strengths and weaknesses of the current environment of diabetes care in China. Today, responsibilities for diabetes prevention and control in China are mainly delegated to health care providers. This effort could be enhanced and complemented by increased support from the government; resources for diabetes management in the community; additional resources and structures from health organizations, and stronger partnerships between health care organizations and the community. The roles of patients and their families in diabetes management should also be elevated. When all the components of macro, meso, and micro level in the ICCC framework are integrated and working together, better outcomes for Chinese diabetics will be achieved.

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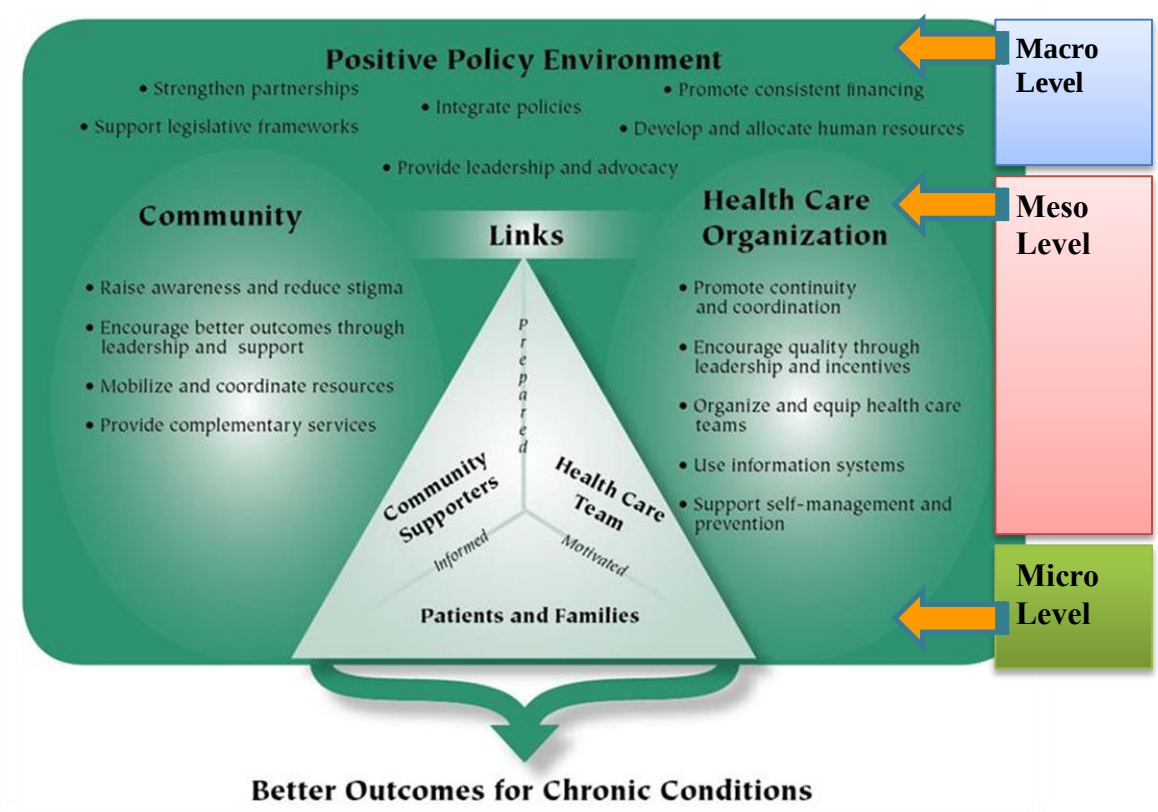

Figure 1. Innovative Care for Chronic Conditions Framework (ICCC)

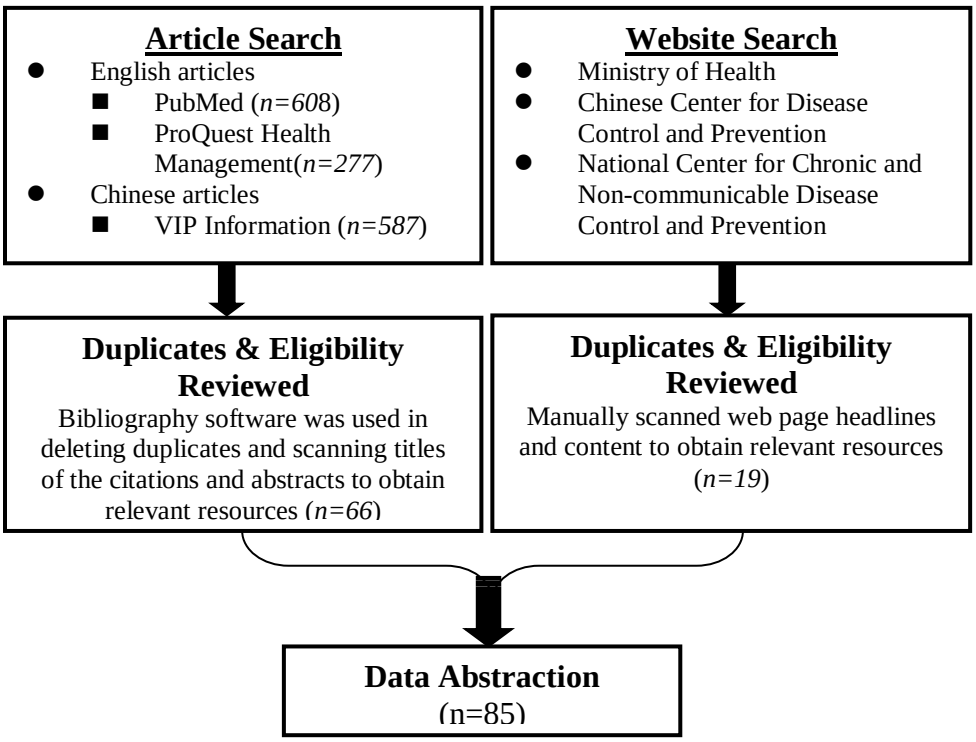

Figure 2. Resources Search and Selection Flow Chart

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